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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,668	09/23/2003	Chie Fukuda	50212-539	9103
20277	7590	09/11/2006	EXAMINER	
MCDERMOTT WILL & EMERY LLP 600 13TH STREET, N.W. WASHINGTON, DC 20005-3096			CHIEM, DINH D	
			ART UNIT	PAPER NUMBER
			2883	

DATE MAILED: 09/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/667,668

Applicant(s)

FUKUDA ET AL.

Examiner

Erin D. Chiem

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 20 June 2006.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3-6,8-16,18-21 and 23-29 is/are pending in the application.
- 4a) Of the above claim(s) 9-13 and 24-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-6,8,14-16,18-21,23 and 29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

This office action is in response to the amendment filed on June 20, 2006. Currently, claims 1, 3-6, 8-16, 18-21 and 23-29 are pending and claims 9-13 and 24-28 are withdrawn from consideration.

#### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Claims 1, 3, 14-16, 18-21, 23, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deacon US (6,243,517 B1) "Deacon" hereafter in view of Wang et al. (US 6,597,497 B2) "Wang" hereafter.

Regarding claim 1, Deacon discloses in Fig. 1 an integrated optical element comprising: an optical semiconductor element including a light emission layer (100), semiconductor optical amplifier (SOA) chip (col. 11, lines 45-60), and outputting light of a predetermined wavelength; an optical circuit element including a silica-based substrate (120 and see col. 8, line 34-col. 9 line

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6), an optical waveguide (120) in which the light from said SOA propagates and which is provided on said substrate and a grating (130) formed on said optical waveguide, the grating together with said SOA, constituting an external resonator (col. 11, lines 25-37); a silicon bench having an element mount surface on which said optical semiconductor element and said optical circuit element are mounted, and a bonding material for fixing said optical circuit element in a predetermined position on the element mount surface of said silicon bench, while being apart from said silicon bench at a predetermined distance (col. 7, lines 63-64).

However, Deacon does not disclose the optical waveguide is bonded to the substrate having a predetermined distance from the substrate.

Wang discloses a semiconductor optical amplifier wherein the guiding waveguide can be bonded onto an active layer and the bonding material between the waveguide and the active layer creates a predetermined distance from the substrate (col. 15, lines 40-44).

It would have been obvious to one having ordinary skill in the art to recognize the teaching of Wang and modify Deacon's invention using a wafer bonding technique to bond the waveguide onto the active layer for the economical motivation of wafer bonding the waveguide onto the active layer versus epitaxially grow the waveguide on the active layer to optimize the performance of the integrated device.

Regarding claim 3, Deacon discloses in Fig. 9 that said optical semiconductor element includes a semiconductor optical amplifier whose end face facing said optical waveguide in said optical circuit element is Anti-Reflection coated (col. 18, lines 23-32).

Regarding claims 15-16, 18, 22, and 29 Deacon also discloses the integrated optical element wherein comprises N number of optical semiconductor elements and N number of

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optical waveguides having a reflection peak wavelength different from each other. The examiner respectfully points applicant to the same citations of the rejection to claims 1-3, 7, and 14 above because Deacon's invention was intended to have N-numbers of optical semiconductor elements coupled to N number of optical waveguides. Therefore, Deacon's invention reads upon both the claims in claimed in singular form and plural form.

Claims 4-5 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deacon and Wang and in further view of Okada et al. (US 6,435,734 B2) "Okada" hereinafter.

Deacon and Wang teach a SOA including a light emission layer, an optical waveguide form on the silicon substrate, having grating and anti-reflective coating to increase transmission efficiency, and wherein the optical circuit is flip-chip bonded to reduce inductance power distribution to the integrated circuit.

However, Deacon does not teach the space between the optical semiconductor elements facing the optical waveguide is filled with resin having a refractive index of 1.300 or more but 1.444 or less.

Okada teaches an optoelectronic module using a silicone-type resin having refractive index  $n=1.4$  (col. 3, line 26) for the purpose of reducing reflection loss.

Since Deacon, Wang, and Okada are all from the same field of endeavor, the purpose disclosed by Okada would have been recognized in the pertinent art of Deacon and Wang.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select a resin having refractive index which matches the refractive index of the waveguide to contain the light beam within the resin medium and transmit from the

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optical element such as the amplifier taught by Deacon to the waveguide The motivation for filling the space with waveguide refractive index matching resin is to reduced reflection loss.

Claims 6 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deacon and Wang and in further view of Forrest et al. (US 2002/0031297 A1).

Deacon and Wang teach a SOA including a light emission layer, an optical waveguide formed on the silicon substrate, having grating and anti-reflective coating to increase transmission efficiency, and wherein the optical circuit is flip-chip bonded to reduce inductance power distribution to the integrated circuit.

However, Deacon does not teach the optical circuit tilts at an angle of 3 to 8 degrees.

Forrest teaches the laser to tilt at an angle of 7 degrees transmitting toward the optical amplifier for the purpose of preventing optical feedback into the optical amplifier.

Since Deacon, Wang and Forrest are all from the same field of endeavor, the purpose disclosed by Forrest would have been recognized in the pertinent art of Deacon and Wang.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ this range of angle tilt given what Forrest has taught for the purpose of preventing optical feedback even though the component taught by Forrest was a laser and not an optical circuit. One of ordinary skills in the art would recognize that regardless of what optical element is use, the criticality of Forrest's teaching is in the coupling of the optical signal relative to the optical axis. The motivation for tilting at an angle between 3 and 8 degrees is for the purpose of preventing optical feedback into the optical amplifier.

Claims 8 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deacon and Wang and in further view of Lee et al. (US 6,411,764 B1) "Lee" hereinafter.

Deacon and Wang teach an integrated optical element including a light emission layer, an optical waveguide form on the silicon substrate, having grating and anti-reflective coating to increase transmission efficiency, and wherein the optical circuit is flip-chip bonded to reduce inductance power distribution to the integrated circuit.

However, Deacon and Wang do not disclose a spot size conversion structure whose FFP is 15 degrees or less.

Lee teaches a core spot size converter having a far field angle approximately 6 degrees for the purpose of efficiently coupling the signal from the waveguide core to the photodetector (col. 5, line 6).

Since Deacon, Wang and Lee are all from the same field of endeavor, the purpose disclosed by Lee would have been recognized in the pertinent art of Deacon

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform mode matching by epitaxially form the waveguide to the correctness. If the thickness of the waveguide increases, the size of the mode decreases thereby the mode is compressed and the mode size becomes smaller and a more of the energy is confined within the waveguide. The motivation for forming a waveguide having the predetermined thickness such that the far field angle is 15 degrees or less is for evanescent coupling wherein mode matching is critical to the efficiency (col. 4, lines 30-67).

### ***Response to Arguments***

Applicant's arguments with respect to claims 1 have been considered but are moot in view of the new ground(s) of rejection.



*Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erin D. Chiem whose telephone number is (571) 272-3102. The examiner can normally be reached on Monday - Thursday 9AM - 5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*EBC*  
9/5/06



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